REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons which follow.

Specification

The Examiner objected to the Abstract based on improper language. The Examiner states:

> The abstract of the disclosure is objected to because the phrase "system is disclosed" in line 1 is improper. Correction is required. See MPEP § 608.01(b).
>
> Applicant is reminded of the proper language and format for an abstract of the disclosure.
>
> The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.
>
> The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Applicants have amended the Abstract to overcome the Examiner's objection.

Double Patenting

In the Office Action, the Examiner rejected the claims based on nonstatutory double patenting. The Examiner states:

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 1, 4-6 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3-5 respectively, of copending Application No. 09/449,701. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 1, 3-5 of the copending application cover equivalent subject matter as claims 1, 4-6 of the instant application, except for the limitation "the image workstation is configured to provide the image manager with a signal representative of the three dimensional rendering". However, it was exceedingly well known for image workstations to communicate, and therefore provide signals to an image manager. For example, the image manager of the instant application is an image server, and therefore, it would have been obvious for the image workstation to provide the image manager with a signal representative of the three dimensional rendering, since the image manager stores all relevant patient information such as ultrasound images and patient reports. Furthermore, one would be motivated to send a signal representative of the three dimensional rendering to the image manager in order to allow other image workstations access to the signal, therefore

enabling the image workstation to construct a three dimensional rendering for diagnosis purposes.

2. Claims 14-19 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 9-14 respectively, of copending Application No. 09/449,701. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application recites the limitation "constructing a three dimensional image file based on the two dimensional image information files" (claim 14, lines 11-12), while the copending application recites the limitation "building the rendering of the three dimensional object based on the two dimensional information files received by the image workstation" (claim 9, lines 11-12). However, it would have been obvious to construct a three dimensional image file during the building of the three dimensional rendering, since the image workstation is a computer with a display, and it was well known for computers to construct an image file before displaying an image. Furthermore, although the claims of the copending application do not claim the limitation "communicating the three dimensional image information to the image manager", it would have been obvious to communicate the three dimensional image information to the image manager, as disclosed above.

3. Claims 23-30 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 15-22 respectively, of copending Application No. 09/449,701. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of the instant application encompass the same subject matter as the claims of the copending application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Applicants have filed a terminal disclaimer in co-pending U.S. Application No. 09/449,701 to overcome the provisional obviousness-type double patenting assertion.

Claims Rejections – 35 USC § 112

In section 4 of the Office Action, the Examiner rejected claims 14-22 and 30 under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The Examiner states:

> Referring to claim 14, the applicant's specification does not sufficiently describe the difference between the "two dimensional image information file" in lines 2-3 and the "two dimensional image file" in line 5.
>
> Referring to claim 30, the applicant's specification does not sufficiently describe the limitation "partial three dimensional rendering" in line 2. For examination purposes, the claimed limitation will be interpreted as a "three dimensional rendering" as disclosed on page 5, line 18 of the applicant's specification.
>
> Claims not mentioned specifically depend from rejected antecedent claims.

Applicants have amended claims 14 and 30 for clarity.

In section 5 of the Office Action, the Examiner rejected claims 2, 3, 7, and 13-22 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states:

> Claim 2 recites the limitation "three dimensional rendering" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. It is suggested that the applicant replace the phrase with "signal".
>
> Claim 13 recites the limitation "three dimensional rendering file" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

> Claim 14 is considered indefinite due to the inconsistent language used to describe the claimed limitations. Specifically, the claim recites "two dimensional image information files" in lines 2-3 and "two dimensional image files" in line 5. It is unclear from the claimed language which "file" is being claimed. Similar inconsistencies occur in lines 11 and 13.
>
> Claims not mentioned specifically depend from indefinite antecedent claims.

Applicants have amended claims 2, 13, and 14 for clarity.

Claim Rejections – 35 U.S.C. § 103

In section 6 of the Office Action, the Examiner rejected claims 1, 6, 14, and 17-19 under 35 U.S.C. 103(a) as being unpatentable over Wood (U.S. Patent No. 5,715,823). The Examiner states:

> Referring to claim 1, Wood discloses:
>
> a. an image manager (10) having a plurality of inputs and outputs (figure 1), the inputs configured to receive image information signals and the outputs configured to provide image output signals, the image manager configured to store information representative of a plurality of two dimensional image slices and the output signals representative of the stored two dimensional image slices (col. 3, lines 3-29).
>
> b. an imaging device (12) having an output coupled to at least one of the inputs of the image manager, and configured to provide an image signal (col. 2, line 62-col. 3, line 6).
>
> c. an image workstation (100) having an input coupled to at least one of the outputs of the image manager (figure 1), and configured to receive output signals from the image manager representative of selected two dimensional image slices stored by the image manager (col. 3, lines 20-24), the image workstation configured to construct three dimensional image renderings from the two dimensional image slices (col. 11, line 63-col. 12, line 3). Note that the "sequence of spatially discrete images" in col. 12, line 2 is interpreted to

mean image slices. Furthermore, the "physician" viewing the images is interpreted as being the user who is located at the image workstation and the image workstation having an output coupled to the image manager (figure 1). Note that the connection between the image manager and image workstation is bi-directional.

Although Wood teaches that the image workstation sends a signal to the image manager (col. 11, lines 56-63), he fails to explicitly state that the signal is representative of the three dimensional rendering. However, it would have been obvious for the image workstation to send a signal representative of the three dimensional rendering to the image manager, since the image manager stores all relevant patient information such as ultrasound images and patient reports (col. 12, lines 64-65). Furthermore, one would be motivated to send a signal representative of the three dimensional rendering to the image manager in order to allow other image workstations access to the signal, therefore enabling the image workstation to construct a three dimensional rendering for diagnosis purposes.

Referring to claim 6, Wood further discloses that the imaging device (12) is a medical (ultrasound) imaging device (col. 2, lines 63-67).

Referring to claim 14 as best understood, Wood discloses a method of producing a rendering of a three dimensional object from a plurality of two dimensional image information files, comprising:

a. receiving by an image manager (10), a plurality of two dimensional image information files from an imaging device (12) (col. 2, lines 63-col. 3, line 9).

b. storing a plurality of two dimensional image files on the image manager (col. 3, lines 3-6).

c. communicating selected two dimensional image information files to an image workstation (100) (col. 3, lines 17-24 and figure 1).

d. receiving a two dimensional image information file by the image workstation (col. 3, lines 17-24).

> Although Wood teaches that a three dimensional presentation is displayed at an image workstation (col. 11, line 63-col. 12, line 3), he fails to explicitly state that a three dimensional image file is constructed. However, Wood teaches that the image workstation is a computer with a monitor (col. 3, lines 30-33 and figure 1). Therefore, since it was well known for computers to construct an image file before displaying an image (presentation) on a monitor, it would have been obvious to construct a three dimensional image file during the display of the three dimensional presentation at the image workstation.
>
> Wood further fails to explicitly disclose communicating the three dimensional image information file to the image manager. However, as disclosed above, it would have been obvious to communicate the three dimensional image information file to the image manager, since the image manager can send or receive image information from the image workstation (col. 11, lines 59-61), and stores all relevant patient information such as ultrasound images and patient reports (col. 12, lines 64-65). Furthermore, one would be motivated to send the three dimensional image information file to the image manager in order to allow the most appropriate specialist who is located at another workstation access to the file for diagnosis purposes (col. 12, lines 3-5).
>
> Referring to claim 17, see the rejection of at least claim 1 above.
>
> Referring to claim 18, see the rejection of at least claim 6 above.
>
> Referring to claim 19, Wood further discloses that the communicating step is carried out over an Ethernet connection (col. 11, line 17).

In section 7 of the Office Action, the Examiner rejected claims 2-5, 7, 12-13, 15-16, and 20-32 under 35 U.S.C. 103(a) as being unpatentable over Wood (U.S. Patent No. 5,715,823), in further view of Alvarez (U.S. Patent No. 6,370,413). The Examiner states:

> Referring to claim 2 as best understood, Wood fails to explicitly state that the three dimensional rendering may be

stored by the image manager as a three dimensional rendering file.

However, Alvarez discloses an image manager (14) that stores a three dimensional rendering as a three dimensional rendering file (col. 5, lines 41-48). Note that the "viewing parameters" in line 41 is interpreted as being analogous to the three dimensional rendering, and the "bookmark" in lines 42-43 is interpreted to mean the three dimensional rendering file.

Therefore, since Wood and Alvarez are both concerned with the management of ultrasound images, it would have been obvious to modify the image manager of Wood, so that it stores the three dimensional rendering as a three dimensional rendering file as taught by Alvarez, in order to increase work-flow flexibility by allowing a user to reconstruct the three dimensionally rendered image without the need of resetting the viewing parameters each time it is viewed (Alvarez, col. 5, lines 33-36).

Referring to claim 3, Alvarez further discloses that the three dimensional rendering file may be selectively communicated to a physician using a PACS (col. 6, lines 24-29). Although he fails to explicitly state that the physician is located at an image workstation, it was exceedingly well known for physicians to utilize an image workstation when viewing images on a PACS. Therefore, it would have been obvious to communicate the three dimensional rendering file to an image workstation, in order to allow a physician located at the workstation to view the medical images for diagnosis purposes.

Referring to claim 4, although Wood teaches that the image manager includes a server for archiving medical pictures (col. 13, lines 15-16), he fails to explicitly state that the image manager includes a picture archival and communications system (PACS) server.

However, PACS servers were exceedingly well known in the art. For example, Alvarez discloses an image manager as disclosed above, that includes a PACS server (col. 6, lines 22-29).

Therefore, since PACS servers were exceedingly well known and commonly used in the art, it would have been obvious to

include the PACS server of Alvarez in the image manager of Wood, in order to provide a system that archives and communicates ultrasound images.

Referring to claim 5, Alvarez discloses an image workstation as disclosed above, that is a PACS workstation (col. 6, lines 22-29).

Referring to claim 7, Alvarez further discloses that the image manager includes a three dimensional rendering file storage (col. 5, lines 41-42 and figure 1). As noted above, the "bookmark" is interpreted to mean the three dimensional rendering file.

Referring to claim 12, Wood fails to teach that the image workstation is configured to provide a three dimensional rendering by surface rendering. However, surface rendering was an exceedingly well known technique for three dimensional rendering. For example, Alvarez discloses a three dimensional rendering by surface rendering (col. 5, lines 21-23).

Therefore, since Wood and Alvarez are both concerned with constructing a three dimensional rendering of ultrasound images, it would have been obvious to configure the image workstation of Wood, to provide a three dimensional rendering by surface rendering as taught by Alvarez, that offers the physician an enhanced view of the patient's anatomy, more particularly viewing of arbitrary planes perpendicular to the primary exam axis (depth information).

Referring to claim 13 as best understood, Wood fails to teach a three dimensional rendering file. However, Alvarez discloses a three dimensional rendering file (bookmark) as disclosed above, that includes the parameters needed to reconstruct the three dimensional image rendering (col. 5, lines 21-25).

Therefore, it would have been obvious to include the three dimensional rendering file of Alvarez, in the image management system of Wood, in order to allow a physician to view a three dimensionally rendered image without the need of resetting the viewing parameters each time the image if viewed (Alvarez, col. 5, lines 34-37).

Referring to claim 15, see the rejection of at least claim 4 above.

Referring to claim 16, see the rejection of at least claim 5 above.

Referring to claim 20, see the rejection of at least claim 2 above.

Referring to claim 21, see the rejection of at least claim 3 above.

Referring to claim 22, see the rejection of at least claim 13 above.

Referring to claim 23, see the rejection of at least claim 2 above.

Referring to claim 24, see the rejection of at least claim 4 above.

Referring to claim 25, see the rejection of at least claim 5 above.

Referring to claim 26, see the discussion of at least claim 6 above.

Referring to claims 27 and 28, Wood discloses a medical scanner as disclosed above, but fails to explicitly state that the medical scanner is a MRI and CT imaging device. However, MRI and CT imaging devices were exceedingly well known in the art.

For example, Alvarez teaches that the imaging system can be based on MRI or CT modalities (col. 7, lines 63-65). Therefore, it would have been obvious to modify the medical scanner of Wood, so that it is an imaging device for MRI and CT as taught by Alvarez, since MRI and CT are both commonly known medical imaging modalities.

Referring to claim 29, Wood further discloses that the image workstation includes a display (element 108 in figure 1).

Referring to claim 30 as best understood, see the rejection of at least claim 29 above.

> Referring to claim 31, see the rejection of at least claim 3 above.
>
> Referring to claim 32, see the rejection of at least claim 13 above.

Further, the Examiner rejected claim 8 under 35 U.S.C. 103(a) as being unpatentable over Wood (U.S. Patent No. 5,715,823) as applied to claim 1, in further view of Kimura (U.S. Patent No. 4,835,688). The Examiner states:

> Referring to claim 8, although Wood teaches that the image workstation is configured to provide a three dimensional rendering as disclosed above, he fails to explicitly state that the rendering is accomplished by multi-plane reconstruction (MPR). However, multi-plane reconstruction was an exceedingly well known technique for three dimensional rendering. For example, Kimura discloses a three dimensional rendering by multi-plane reconstruction (col. 5, lines 26-30).
>
> Therefore, since Wood and Kimura are both concerned with constructing a three dimensional rendering of medical images, it would have been obvious to configure the image workstation of Wood, to provide a three dimensional rendering by multi-plane reconstruction as taught by Kimura, that offers the physician an enhanced view of the patient's anatomy, more particularly viewing of arbitrary planes perpendicular to the primary exam axis (depth information).

Further still, the Examiner rejected claims 9 and 11 under 35 U.S.C. 103(a) as being unpatentable over Wood (U.S. Patent No. 5,715,823) as applied to claim 1, in further view of Fox (U.S. Patent No. 5,668,846). The Examiner states:

> Referring to claims 9 and 11, although Wood teaches that the image workstation is configured to provide a three dimensional rendering as disclosed above, he fails to explicitly state that the rendering is accomplished by multi-plane volume reconstruction (MPVR). However, multi-plane volume reconstruction was an exceedingly well known technique for three dimensional volume rendering. For example, Fox discloses a three dimensional volume rendering by multi-plane volume reconstruction (col. 7, lines 15-20).

> Therefore, since Wood and Fox are both concerned with constructing a three dimensional rendering of medical images, it would have been obvious to configure the image workstation of Wood, to provide a three dimensional volume rendering by multi-plane volume reconstruction as taught by Fox, that offers the physician an enhanced view of the patient's anatomy, more particularly viewing of arbitrary planes perpendicular to the primary exam axis (depth information).

Yet further still, the Examiner rejected claim 10 under 35 U.S.C. 103(a) as being unpatentable over Wood (U.S. Patent No. 5,715,823) as applied to claim 1, in further view of Cline (U.S. Patent No. 5,226,113). The Examiner states:

> Referring to claim 10, although Wood teaches that the image workstation is configured to provide a three dimensional rendering as disclosed above, he fails to explicitly state that the rendering is accomplished by maximum intensity pixel (MIP) projection. However, MIP projection was an exceedingly well known technique for three dimensional rendering. For example, Cline discloses a three dimensional rendering by MIP projection (col. 4, lines 20-23).
>
> Therefore, since Wood and Cline are both concerned with constructing a three dimensional rendering of medical images, it would have been obvious to configure the image workstation of Wood, to provide a three dimensional rendering by MIP projection as taught by Cline, that offers the physician an enhanced view of the patient's anatomy, more particularly viewing of arbitrary planes perpendicular to the primary exam axis (depth information).

Limitations of claims 4 and 5; 15 and 16; and 24 and 25 have been incorporated into their respective independent claims. The Examiner states that it was well known to communicate an image file before displaying an image on a monitor. Applicants have not, however, claimed such a system. Applicants claim a novel system in which the PACS server communicates two dimensional image slices to a PACS workstation. The two dimensional slices are rendered into a three dimensional image on the PACS workstation. Then, the three dimensional image file is communicated to the PACS server for storage. Alvarez does not disclose rendering a three dimensional image on a PACS workstation.

taught by Wood. (claim 1).

Alvarez discloses performing the three dimensional rendering and then communicating the three dimensional rendering to an image workstation. By performing the three dimensional rendering on the workstation, the PACS server is then available to perform communications with other workstations and imaging devices instead of using resources to perform the three dimensional image rendering especially in the case that the three dimensional rendering is being done in advance for access, through the PACS server at a later time and possibly at a different location. Accordingly, claims 1, 14, and 23 as amended are not obvious under Wood and Alvarez, alone or in any proper combination. Claims 1, 14, and 23 and their dependents are therefore allowable.

* * *

After amending the claims as set forth above, claims 1-3, 6-14, 17-23, and 26-32 are now pending in this application.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

Date December 20, 2002 By Alistair K. Chan

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APPENDIX A

[SECONDARY CAPTURE OF 3D-BASED IMAGES ON A PACS SYSTEM]

ABSTRACT

An image management system (10), [such as] includes a PACS system [is disclosed]. The PACS system (10) includes a PACS server (20) coupled to a communications network (22) and a plurality of PACS workstations (40) also coupled to a communications network (22). Each PACS workstation (40) is configured to receive two dimensional image information and produce a three dimensional image rendering on the PACS workstation (40). The three dimensional image rendering is communicated to the PACS server (20) for storage and later retrieval.

APPENDIX B

MARKED UP VERSION SHOWING CHANGES MADE

1. (Amended) An image management system comprising:

[an image manager] a picture and archival and communication system (PACS) server having a plurality of inputs and outputs, the inputs configured to receive image information signals and the outputs configured to provide image output signals, the [image manager] PACS server configured to store information representative of a plurality of two dimensional image slices, and the output signals representative of the stored two dimensional image slices;

an imaging device having an output coupled to at least one of the inputs of the [image manager] PACS server, and configured to provide an image signal; and

[an image] a PACS workstation having an input coupled to at least one of the outputs of the [image manager] PACS server, and configured to receive output signals from the [image manager] PACS server representative of selected two dimensional image slices stored by the [image manager] PACS server, the [image] PACS workstation configured to construct three dimensional image renderings from the two dimensional image slices and the [image] PACS workstation having an output coupled to the [image manager] PACS server and configured to provide the [image manager] PACS server with a signal representative of the three dimensional rendering.

2. (Amended) The image management system of claim 1 wherein the three dimensional rendering signal may be stored by the [image manager] PACS server as a three dimensional rendering file.

3. (Amended) The image management system of claim 2 wherein the three dimensional rendering file may be selectively communicated to [an image] a PACS workstation.

7. (Amended) The image management system of claim 2 wherein the [image manager] PACS server includes a three dimensional rendering file storage.

8. (Amended) The image management system of claim 1 wherein the [image] PACS workstation is configured to provide a three dimensional rendering by multi-plane reconstruction (MPR).

9. (Amended) The image management system of claim 1 wherein the [image] PACS workstation is configured to provide a three dimensional rendering by multi-plane volume reconstruction (MPVR).

10. (Amended) The image management system of claim 1 wherein the [image] PACS workstation is configured to provide a three dimensional rendering by maximum intensity pixel (MIP) projection.

11. (Amended) The image management system of claim 1 wherein the [image] PACS workstation is configured to provide a three dimensional rendering by volume rendering.

12. (Amended) The image management system of claim 1 wherein the [image] PACS workstation is configured to provide a three dimensional rendering by surface rendering.

13. (Amended) The image management system of claim [1] 2 wherein the three dimensional rendering file includes the parameters needed to reconstruct the three dimensional image rendering.

14. (Amended) A method of producing a rendering of a three dimensional object from a plurality of two dimensional image information files, comprising:

receiving, by [an image manager] a picture archival and communication systems (PACS) server, a plurality of two dimensional image information files from an imaging device;

storing [a] the plurality of two dimensional image information files on the [image manager] PACS server;

communicating selected two dimensional image information files to [an image] the PACS workstation;

receiving [a] the selected two dimensional image information [file] files by the [image] PACS workstation;

constructing a three dimensional image information file based on the selected two dimensional image information files; and

communicating the three dimensional image information file to the [image manager] PACS server.

17. (Amended) The method of claim 14 further comprising:

receiving a plurality of two dimensional image slices by the [image] PACS workstation.

20. (Amended) The method of claim 14 further comprising:

storing the three dimensional image file by the [image manager] PACS server.

21. (Amended) The method of claim 20 further comprising:

communicating the three dimensional image file stored by the [image manager] PACS server to [an image] the PACS workstation.

23. (Amended) A medical imaging system, comprising:

a medical scanner;

[an image manager] a picture archival and communication system (PACS) server coupled to the medical scanner and configured to receive and store signals representative of two dimensional image slices from the medical scanner;

[an image] a PACS workstation configured to receive selected signals representative of two dimensional image slices and configured to construct a three dimensional rendering file from the signals representative of the two dimensional image slices,

wherein the three dimensional rendering file is communicated to and stored by the [image manager] PACS server.

29. (Amended) The medical imaging system of claim 23 wherein the [image] PACS workstation includes a display.

30. (Amended) The medical imaging system of claim 29 wherein the [image] PACS workstation is configured to provide a [partial] three dimensional rendering representative of the three dimensional rendering file on the display.

31. (Amended) The medical imaging system of claim 23 wherein the three dimensional rendering file may be selectively communicated to [an image] the PACS workstation.